EXPIRES January 1, 2006 *REPORT #1-05, May 1, 2005*

US ARMY WHITE SANDS MISSILE RANGE

BG Robert J. Reese
Commanding General
US Army White Sands Missile Range

Brigadier General Reese assumed command of US Army White Sands Missile Range in July 2003 following 2 years at Fort Carson, Colorado, where he was the Deputy Commanding General, 7th Infantry Division. During his tenure at White Sands, he has emphasized teamwork among the partners located there (Team White Sands) and among the US Army Developmental Test Command centers and proving grounds. He has also stressed process improvement, initiating efforts that will examine and reshape all White Sands Test Center processes over the next several years.

US Army White Sands Missile Range (WSMR) is a superlative tri-Service facility for research, development, test, evaluation, and training. Located in south-central New Mexico, WSMR utilizes the Defense Research and Engineering Network, the Internet, and its vast real estate to provide a broad assortment of testing capabilities and infrastructure. These resources and services include the largest open-air/over-land highly instrumented range in the hemisphere, a full range of test facilities and capabilities, superb modeling and simulation, and interoperable networks. In addition to many Army programs, the range hosts numerous tests for all of our military Services. Army, Navy, Air Force, Defense Threat Reduction Agency, and other "Team White Sands" members add specialized test capabilities with tremendous value to WSMR. The testing support essential to WSMR programs must continue to evolve and must remain relevant to meet the needs of test and training of the transforming wartime forces. We are proceeding to transform our Test and Evaluation (T&E) into a network-centric,digitally instrumented, interoperable, plug-and-play distributed test infrastructure and a multidisciplined capability for the 21st century range.

The Nation is at war, and our Department of Defense (DOD) and military Services are changing to meet current and future challenges. One of the four pillars of


BG Robert J. Reese

DOD transformation involves the strengthening and integrating of joint and combined forces. These forces will be network-centric and will require compatible systems with interoperable communication standards, doctrine, materiel, tactics, and techniques. The DOD recognizes that interoperability requirements must be integrated into the design of new systems and that testing and training capabilities must be transformed to adequately field these systems.

The WSMR goal is to provide a Live-Virtual-Constructive (LVC) test and training environment to support current and future needs of the warfighter. This LVC environment will center on system-of-systems, joint integration, and joint operations efforts. The impetus for our range and others to change increases significantly as the Future Combat Systems (FCS) program continues to evolve.

(continued on page 4)

CONTENTS

TestBytes

BG Combest Assumes DTC Command

The top leadership within the US Army Test and Evaluation Command (ATEC) has changed during the latter part of 2004. At ATEC Headquarters, MG James R. Myles (previously CG of the Operational Test Command at Fort Hood, Texas) succeeded MG Robert E. Armbruster as commander. At DTC, BG Michael L. Combest is the new commander, succeeding BG Keith McNamara. It is appropriate that this first issue of the technology report introduce our new commander.

On October 27, 2004, BG Michael L. Combest assumed command of the US Army Developmental Test Command. He comes from his recent assignment as Chief, Defence Planning Sub-division, Allied Command Transformation Staff Element Europe, at SHAPE in Casteau, Belgium.

A 1974 graduate of the US Military Academy at West Point, his educational background includes a master of military arts and sciences from the US Army Command and General Staff College. He is also an Advanced Operational Studies Fellow and has attended the US Army Command and General Staff College and the Field Artillery Basic and Advanced Courses.

BG Combest has commanded artillery units from battery through brigade with assignments at Fort Sill, Oklahoma, Fort Ord, California, and Fort Hood, Texas. He has held a variety of staff positions, including Assistant Division Commander (Maneuver), 1st Infantry Division (Mechanized), Germany; Assistant Deputy Chief of Staff for Combat Developments, US Army Training and Doctrine Command in Fort Monroe, Virginia; Operations Officer, School of Advanced Military Studies, US Army Command and General Staff College. He also served as an exchange instructor at the Australia School of Artillery.

BG Combest has been awarded the Legion of Merit (with Oak Leaf Cluster), Bronze Star, Meritorious Service Medal (with three Oak Leaf Clusters), Joint Service Commendation Medal, Army Commendation Medal (with two Oak Leaf Clusters), Army Achievement Medal, and Parachutist's Badge.

The *DTC Technology Report (DTR)* is published quarterly by the Technology Management Division, Directorate for Test and Technology, US Army Developmental Test Command, Aberdeen Proving Ground, MD 21005-5055. *DTR* is distributed to a mailing list of members of the DOD, industry, and academic T&E communities. Letters and articles are solicited from the DOD T&E community. All submissions are accepted at the discretion of the editor and are subject to editing.

Publisher .... Technology Management Division
Editor .... Richard S. Cozby
.... ttm@dtc.army.mil
.... DSN 298-1474
.... Fax DSN 298-1475
Electronic Publishing .... TRI-S Incorporated
.... (410) 273-9414

Check out the electronic issues of *DTR* on the World Wide Web at http://www.dtc.army.mil/ (use the publications link).

TTS 2005 in Portsmouth, VA

Portsmouth Ship Symbolizing Portsmouth, Virginia

After a very successful technology symposium (TTS 2004) last year on the west coast in San Diego, the US Army Developmental Test Command will bring the conference back east for 2005. The theme is "Test Technology –Transforming Joint Experimentation Testing and Training. The site will be the city of Portsmouth, Virginia, a central location and a quaint town with a lot of history. A key reason for selecting Portsmouth is its proximity to the U.S. Joint Forces Command (JFCOM) in Suffolk, Virginia. The symposium will be held 15-16 June 2005.

Over the years these events have proven successful in meeting their goal to enable testers to learn about emerging technologies for new military equipment, and for customers (developers, trainers, and warfighters) to find out about test technologies which will benefit their programs. Top leaders in the Department of Defense are requiring the Services to operate as a joint force on the battlefield. This means that the test & evaluation community must develop technology to test jointly.

TTS 2005 will present a program featuring top officials from JFCOM and the Services who will set the course for new and innovative ways to test to meet the joint fighting mission. A Call for Papers will be circulated in the near future with more information about this significant event.

(TestBytes continued on page 12)

WSMR Directed Energy Test and Evaluation Capabilities (DETEC)

Brad A. King
Sensor Development Division, Business and Technology Development Directorate
US Army White Sands Missile Range

Directed Energy (DE) testing has been conducted at White Sands for a number of years and as DE systems such as Airborne Laser, Mobile Tactical High Energy Laser, and Advanced Tactical Laser, begin open-air testing, the ability to support/conduct testing at a variety of Major Range and Test Facility Bases (MRTFB) must be developed and fielded. Legacy range instrumentation is inadequate and in some cases nonexistent to support these programs at a number of varied geographic locations. Approximately 3 years ago, White Sands proposed a tri-Service effort, along with Navy and Air Force partners, to develop and field the capabilities necessary to support DE testing (developmental testing, operational testing, and live fire), both for High -Energy Lasers (HEL) and High- Power Microwaves (HPM). As a result of these efforts, a tri-Service study effort led by the Air Force to document the needed capabilities identified shortfalls.

Solutions to these shortfalls are now being developed under an Office of the Secretary of Defense (OSD)-funded/Army-led effort. Directed Energy Test and Evaluation Capabilities (DETECs) have been approved/funded and will specify, design, develop, and integrate new DE Test and Evaluation (T&E) capabilities into the DOD MRTFB for the Services over the next 5 years.

Advancements in HPM and HEL have potentially created a new class of weapon systems of the types shown in figure 1. These DE systems will precipitate a revolutionary change in future engagements, employments, and concepts of operations. Both HEL and HPM travel to the target at the speed of light, are capable of graduated effects (deny, disrupt, degrade, and/or destroy), and can be used to minimize collateral damage. DE weapons are on the horizon. We must be ready to test and use them safely and effectively in all required environments.

Before these systems can be put to use on the battlefield, adequate equipment, instrumentation, and facilities must be in place to perform the testing. The United States must be able to test and document DE effects. Current DETECs are fragmented, fixed, and not functionally integrated. These capabilities are insufficient to support requirements for the spectrum of testing required for DE acquisition (developmental, operational, and live-fire), including the testing of our non-DE systems when subjected to a DE threat.

Figure removed for security reasons

Figure 1. Examples of Directed Energy

The White Sands Business and Technology Development Directorate, Sensor Development Division, developed, coordinated, and staffed the tri-Service DETEC proposal to the OSD Central T&E Investment Program (CTEIP) in late FY01. This initiated development of transportable instrumentation/infrastructure to support DE T&E. In response to the proposal, CTEIP chartered and funded the DETEC tri-Service study (T-SS) at the beginning of FY03 to assess DE T&E requirements, capabilities, shortfalls, and proposed solutions. The tri-Service study was managed by the Air Force Operational Test and Evaluation Command (AFOTEC), with White Sands as the Army deputy, Naval Sea Systems Command (Port Hueneme Detachment) as the Navy deputy, and AFOTEC as the Air Force deputy. DE T&E requirements were reviewed, assessed, and documented during three Service workshops conducted in 2003. These Service workshops averaged 4 days in length and involved an average of 60 attendees. The workshops documented DE T&E requirements for the three Services. A survey was then sent to all MRTFB activities and test facilities to determine existing DETECs. Specific responses were solicited based on detailed requirements that flowed from each Service workshop.

By a comprehensive comparison of requirements against existing capabilities, shortfalls of DE T&E were documented. Solutions to these shortfalls were then requested from industry, academia, and government to scope the cost, schedule, risk, operations/maintenance costs, mobility, and maturity. The proposed

(continued on page 4)

US ARMY WHITE SANDS MISSILE RANGE

Commander's Overview

(continued from page 1)

Based upon the complexity of the FCS operational range environment, our initial plan would require stressing the entire T&E community and require a system-of-systems approach to testing. This need to conduct system-of-systems testing was the primary factor influencing us to modify our practices. However, recent changes in the FCS program reflect the Army Chief of Staff's goal to field selected FCS capabilities as soon as possible in support of the global war on terrorism, and to address technical realities associated with a number of the key FCS systems. Those changes also provide additional details about the program, to include plans to "spiral out" capabilities to the experimental Unit of Action/Brigade Combat Team (BCT) and other BCTs. WSMR was designated as the site for FCS technical field tests. This designation and recent FCS program changes will have an even larger impact on how we conduct our business and will provide greater impetus for transformation.

IRCC-A Keystone for Range Transformations

The aforementioned changes to the FCS program also reinforced the need for a distributed test capability. A year ago, DTC directed WSMR to develop an inter-range test control capability, building on our experience with complex tests involving off-range target launches and multiple aerial platforms (both targets and test vehicles). The US Army Test and Evaluation Command (ATEC) designated that capability as the ATEC Inter-Range Control Center (IRCC). Each of DTC's other test centers is developing a compatible Distributed Test Control Center (DTCC). The IRCC and DTCCs will enable both ATEC testers and testers across the "joint" community to share test center resources. This will be particularly important during system-of-systems testing when a limited number of platforms and other systems will be available. The IRCC is also DTC's single entry and exit point for connectivity to the Lead Systems Integrator's System-of-Systems Integration Laboratory. Distributed testing will drive transformation and demonstrate progress.

Another significant commitment by White Sands is support of directed-energy weapons development. Obviously, the range's extensive land area, airspace, and remote location make it an ideal location for directed-energy development and testing. Equally important, test center planners worked closely with Air Force and Navy counterparts and Director, Operational Test and Evaluation representatives to program the funds necessary to ensure that directed energy instrumentation technology is available for future testing.

A growing relationship between testing and training with joint partnerships

WSMR partnerships, as described in other articles of this report, illustrate the growing close relationship between testing and training. White Sands resources and joint partners are providing unparalleled support for operational training and combined test/training activities. Located adjacent to Holloman Air Force Base and Fort Bliss, and with our numerous joint, interagency, and multinational team members, WSMR offers unrivaled regional solutions for operators, developers, testers, and trainers. As we evolve, ongoing initiatives will help us create solutions that will blur the distinction between developmental testing, operational testing, and training and thus provide better utility to the DOD. A number of our key initiatives are described in the articles of this technology report. ⌘

WSMR Directed Energy Test and Evaluation Capabilities (DETEC)

(continued from page 3)

solutions were independently assessed by the National Research Council with respect to cost, schedule, risk, etc. This information was presented to the DETEC T-SS Senior Review Group, to the OSD Test Investment Coordination Committee, and to the CTEIP Program Element Manager. Mr. Brian Simmons (DTC Technical Director) represented the Army on the Senior Review Group. Sixteen FY04 HEL shortfalls and twenty-two HPM shortfalls were identified. The DETEC team started early risk reduction efforts late in FY04, and is now proceeding in earnest in early FY05, with award of a Lead System Integration contract to begin individual DE T&E shortfall developments as identified in the tri-Service study effort.

38 Directed Energy testing shortfalls identified by tri-Service workshops

For additional information, contact: Brad A. King, DETEC Technical Project Manager at (505) 678-7545; email: kingb@wsmr.army.mil ⌘

Inter-Range Control Center (IRCC) Supporting
Joint and Interagency Distributed Testing Requirements

William A. Gilbert
Chief, IRCC
White Sands Test Center
US Army White Sands Missile Range

History has shown that technology can act as a major force multiplier and when combined with collaboration, results are realized that otherwise would be considered unattainable. The 21st century warfighter is looking to exploit technology to speed up the delivery and implementation of systems to protect the American way of life. The tester must develop tools to assure the warfighter gets the technology he needs. This article addresses this problem and the key tool being developed to solve it.

The centerpiece of WSMR's distributed testing technology is their Inter-Range Control Center (IRCC). It adds the dimension which will enable evaluation of tomorrow's weapons and their use in a joint warfighting environment. As more technology is introduced into America's warfighting capabilities, the battlefield environment becomes more and more complex. To test, train, and experiment within the increasingly complex battlefield environment requires the ability to manage, synchronize, and distribute endless amounts of information arriving from a diverse collection of sensors deployed on a variety of platforms. The IRCC, under development at White Sands Missile Range, is a facilitator that will help create this accurate, realistic, and capable battle space environment by linking sensors, instrumentation systems, simulations, and test facilities so that information can be translated, synchronized, collected, and analyzed in a manner an evaluator, trainer, and experimenter can use.

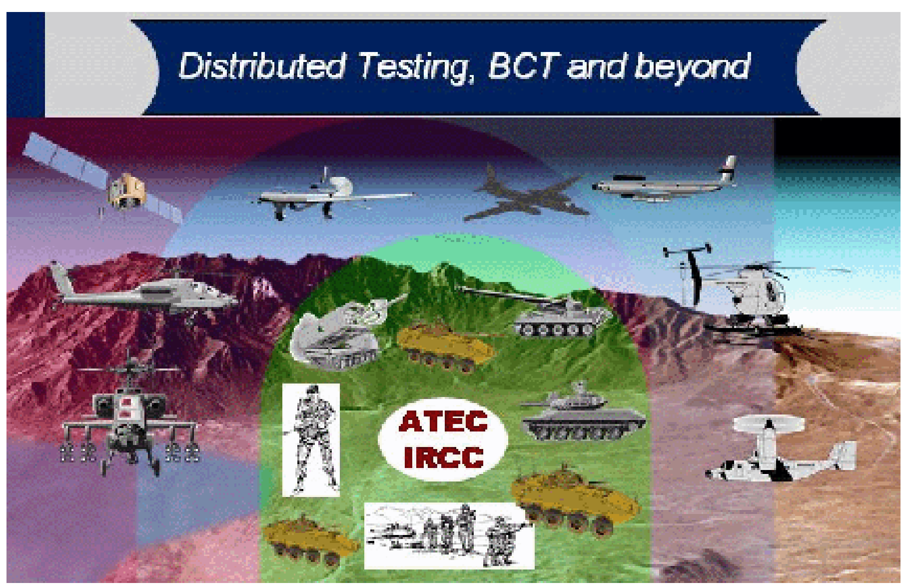
To accomplish such a daunting task requires collaboration, coordination, and leadership. No one test range or facility can create this capability alone. Creating a lifelike synthetic environment dynamic enough to exercise a system and its sensors, to include the human senses, and collect information on the performance of the system and sensors is no simple feat. There must be a managed network, which is robust enough to handle large amounts of traffic with a minimum amount of latency.

A managed network, robust enough to handle large amounts of traffic with minimum latency.

Personnel from geographically dispersed sites must collaborate and interact with each other. A set of processes and control of the environment are necessities for a common understanding of the environment, the exchange of information, and the ability to rapidly reconfigure sensors, instrumentation systems, and simulations to meet the mission requirements. The role of the IRCC is to facilitate this collaboration, ensure the defined processes are followed and utilized, integrate synthetic environments, and provide test and configuration management of systems and software, simulator and emulation elements. The relationship of the three information networks is shown in figure 1.

The Brigade Combat Team is a major distributed test and evaluation program to be supported by the Army's Developmental Test Command (DTC). To prepare for this program the IRCC, along with Distributed Test Control Centers (DTCCs) within the DTC, demonstrated the command's ability to perform distributed testing. Three complex demonstrations were conducted during a recent 6-month period.

Although identified as demonstrations, rather than tests, over 100 computer assets were used, managed, controlled, and synchronized by the IRCC and supporting DTCCs. Much of the credit for the success goes to the talented personnel involved in the demonstrations and their ability to work together as a cohesive unit with one goal in mind. However, utilizing the concept of an IRCC and associated DTCCs played a major role in realizing this cohesion. The IRCC provided the synergistic effect which made possible the ability to demonstrate a phenomenal capability. ⌘



System of System Testing | Integration | Event Control | Time Sequencing | Communications | Data Management | Configuration Management | Video Teleconferencing | Sensor Management | Tactical Interfaces | Visualization | Video Steaming | Linking Systems and Facilities

Figure 1. The Relationship of the Three Networks

Joint Pacific Range Support Team (PRST)

WSMR Extends Capability to the Pacific

Greg Vickers
Material Test Directorate
US Army White Sands Missile Range

The concept of joint testing is well illustrated by the cooperation of five testing ranges operated by Army, Navy and Air Force agencies to meet requirements of the Missile Defense Agency (MDA). Over 40 White Sands Missile Range (WSMR) personnel and equipment, including a new Transportable Telemetry System (TTS) will support a variety of critical missions over the Pacific.

Figure removed for security reasons

Figure 1. Test Launch for Flight over the Pacific Range

In the 1990's WSMR was the test location for many Theater Missile Defense "Hit to Kill" weapon systems being developed by the Ballistic Missile Defense Organization (BMDO). Over the years several changes have taken place; BMDO has been renamed the MDA, the Patriot Advanced Capability (PAC) three weapon system has been transitioned to the Army, and many of the future ballistic missile intercepts tests planned by MDA, exceed the boundaries of WSMR. The majority of the future MDA testing will take place in the Pacific. WSMR has strived to maintain a good working relationship with MDA and was asked to be a member of the newly formed group of ranges that will support MDA test activities. Referred to as the Pacific Range Support Team (PRST), the group is a coalition of Department of Defense (DOD) and commercial test ranges embarking on a worldwide adventure in Ballistic Missile Defense System (BMDS) flight-testing.

A photo of a test launch over the Pacific range is shown in figure 1.

The team will be providing test planning and execution expertise and range resource management for a series of tests in the near future. The PRST comprises the US Army Ronald Reagan Ballistic Missile Defense Test Site (RTS) at Kwajalein Atoll in the Marshall Islands; the 30th Space Wing (30SW) at Vandenberg Air Force Base; the Naval Air Warfare Center Weapons Division at Point Mugu; the Pacific Missile Range Facility in Hawaii (shown in figure 2, page 9); the Alaska Aerospace Development Corporation's Kodiak Launch Complex (KLC); and WSMR. The PRST was chartered on July 8, 2003, by the MDA Test Resource Directorate to provide integrated range support for the Agency in the areas of:

(1) test planning and execution
(2) development of processes, procedures, and standards
(3) development and operation of mobile range instrumentation and test bed infrastructure

A Concept of Operations (CONOPS) has been created to detail the process for these ranges to work together as an integrated team and includes procedures and formalities of inter-range and MDA-range working relationships. It also establishes a common vision among and between military Services and the MDA for planning, supporting, and executing flight and ground test operations within the Pacific test bed and other facilities. It details a flexible and highly responsive range support system capable of accommodating existing, planned, and future MDA testing in support of the BMDS. A Memorandum of Agreement will serve to structure these range relationships and their respective responsibilities. The Universal Documentation System will be employed as the standard for mission planning and execution. A lead range concept will be used as an integrating function to ensure all tasks are coordinated and executed in support of a particular program or test series. The CONOPS is also carefully structured to not interfere with the individual Test Range Commander's authorities and responsibilities.

One of the first MDA tests WSMR is supporting in the Pacific is the Ground-Based Midcourse Defense (GMD) System Integrated Flight Test 13C target launch from the KLC in Alaska. The test will involve the launch of a target vehicle from KLC and a kill vehicle launched from the Reagan Test Site. In August 2003, WSMR shipped 46 pieces of equipment to provide radar, telemetry, timing, realtime data processing, communication, frequency monitoring, command destruct capability, flight safety engineering, and missile flight safety support. In September 2003, over 40 WSMR personnel set up and conducted initial systems integration testing with the WSMR instrumentation and other equipment provided by the 30th SW, Naval Air Weapons Division, and KLC in preparation for a December launch.

Guillermo A. Sanchez of the Materiel Test Directorate is the Pacific Range Support Team Up-Range Instrumentation Team Lead for the test. Mr. Sanchez said that the coordination for this mission has proven to be the most challenging of his 20-year career due to the large number of organizations and people involved. Furthermore, he predicts that this type of support will be the shape of things to come, where WSMR puts its expertise and equipment on the road to support missions that can't be accommodated on the range. "The people from all these organizations

(continued on page 9)

Situational Awareness to ‘RAVE’ About

Realtime Augmented Video Engine (RAVE) Assists Test Conductors

Hector Gurrola
Sensor Development Division, Business and Technology Development Directorate, US Army White Sands Missile Range, NM

Human beings are very efficient at processing visual information, and for individuals immersed in an information-rich environment, visual input is critical to their overall situational awareness. As testers become more immersed in combined scenarios of real and virtual entities, they must be able to visualize the test scene as it unfolds. The system described in this article will allow decisionmakers to see the system(s) performing in a realistic, albeit augmented, scenario.

Figure 1. Fused Image of the Stryker Vehicle

Realtime imagery, delivering information to the end user

In order to conduct Developmental Test and Evaluation, Operational Test and Evaluation, and Live Fire Test and Evaluation activities, project managers with systems under test (as well as the entire test and evaluation community) require a comprehensive, situational awareness based on realtime imaging and other non-image data to effectively and safely conduct their tests. As system-of-systems testing requirements expand to encompass multiple manned and unmanned entities, realtime imaging becomes increasingly complex. It is already a significant challenge for test conductors to quickly understand what they are seeing in a particular image and to comprehend where the image is located relative to the entire scenario. Additionally, due to obscurants such as dust or clouds, the image may not provide enough useful information. Without full situational awareness for large-scale exercises or close-in unmanned vehicle (UV) exercises, the test planning and execution process is cumbersome and time-consuming, resulting in the inability to provide and execute a test scenario that meets all the requirements.

With the advent of digital imaging and test support networks to sustain the shipment of realtime imagery, it is possible to deliver information to the end user in a format not previously available. RAVE is a concept that integrates a combination of existing realtime hardware and software enhancement algorithms and augmentation techniques to provide increased image understanding to the end user.

Enhancement includes image stabilization/contrast enhancement through realtime processing and image fusion from multiple sensors. (illustrated in figures 1 and 2).

Image augmentation is a particularly high-value application. The concept combines live video with other realtime data inputs as well as premission information including digital elevation terrain and pre-generated visual information. For example, the imagery collected by a long focal length, narrow field-of-view digital sensor can be combined in realtime with a three-dimensional graphic rendering of the entire scene that includes synthetic or

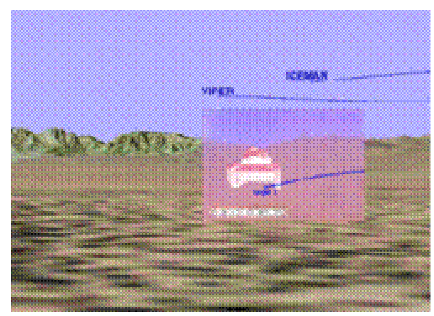


Figure 2. Target Identified and Augmented for Image Understanding

constructive information about other tests or the overall test environment (i.e., vehicle temperature, identification of airborne obscurants, tags on special vehicles). The current transition from film and analog video to digital optical sensors, along with a transport network, offers many new opportunities for exploiting the inherent benefits of optical information.

For additional information, please contact Hector Gurrola at 505-678-1368; email: gurrolah@wsmr.army.mil ⌘

NASA Neural Network Technology to Boost WSMR Optical Tracking Effectiveness

Filiberto Macias
Technology Research Office,
Business and Technology
Development Directorate,
US Army White Sands
Missile Range

The tracking of aerial targets using high-powered optics has long been recognized as a White Sands Missile Range (WSMR) strong point. This article describes how they are applying a technology from NASA utilizing neural network software. Although neural networks are not a new technology, application to the data reduction and management system will meet the needs of ever-evolving smaller targets and speeds.

WSMR's Optical Data Management System (ODMS) provides optical data reduction capability for most range missions. The ODMS partially automates the data reduction process by extracting azimuth, elevation, and timing information encoded within the video or film frame. However, ODMS facility personnel must manually process each image by selecting various points with the mouse cursor. The data extracted manually includes the bore-sight error (horizontal and vertical pixel positions of the target's nose, tail, etc.), V-Angle, miss distance, roll angle, and roll rate. Tracking is done on a small point such as a jet nose cone as shown in figure 1.

Efforts are underway to develop the Next Generation Optical Data Management System (NG-ODMS). An additional capability planned for the NG-ODMS is automatic target tracking. An investigation was conducted to determine the effectiveness and reliability of several image processing algorithms in providing automatic target tracking capability. One of the more promising applications is the Neural Network Feature Tracking (NNFT) algorithm developed by NASA's Jet Propulsion Laboratory (JPL).

The concept of neural network technology was first proposed in the 1940s and was the subject of intensive research in the '80s and '90s. Neural nets are computers configured to imitate the brain's system of information processing, in which data are structured not by a central processing unit, but by an interlinked network of simple units called neurons. The neurons are not programmed; however, they learn to do tasks through a training routine in which desired responses to stimuli are reinforced and unwanted ones are ignored. Though researchers have demonstrated that nets should be highly effective for certain kinds of computation (particularly pattern recognition), it has been difficult for artificial neural networks even to approach the power of biological systems like the human brain. Even large nets with more than 1,000 neurons and 10,000 interconnections have shown lackluster results compared with theoretical capabilities.

The JPL originally developed the NNFT in hardware using optical devices such as lenses and filters. The laboratory is currently implementing the NNFT algorithm as a software application. The advantage of the software is that it can be more easily incorporated into the NG-ODMS or other software applications that have been specifically designed for use at WSMR.

The NNFT algorithm utilizes frequency domain analysis to track features present in the digital image. Target features are grouped together as a feature set in a multi-dimensional "feature space." Features found in the image that fall within a target's feature set are determined to be a correct match and are tracked. The neural network automatically learns new nodes (an example of a match) and adapts the feature set accordingly.

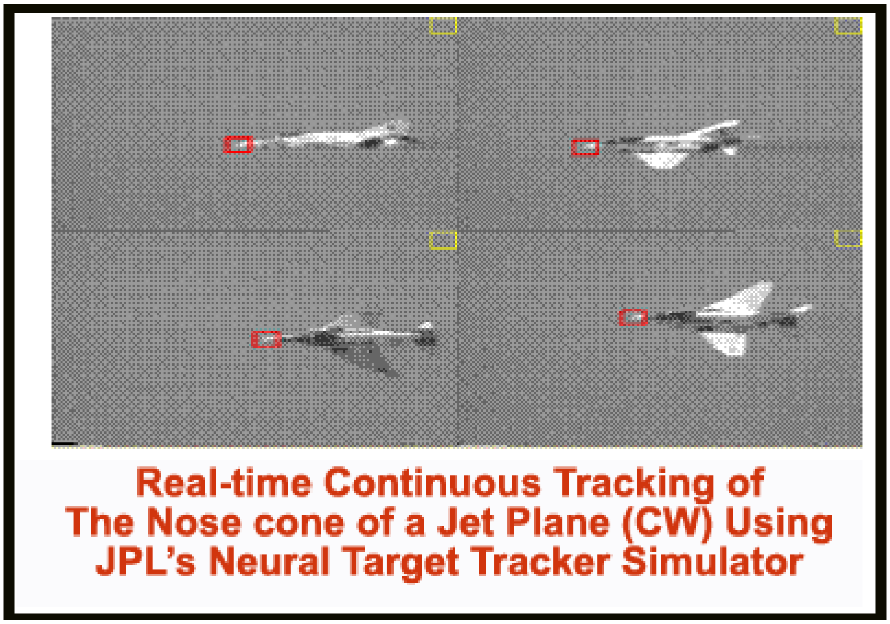


Figure 1. Realtime Continuous Tracking of the Nose Cone of a Jet Plane Using JPL's Neural Target Tracker Simulator

The JPL's effort on the ODMS demonstrates the ability of this technology to improve some rather mundane data collection tasks. Future work with the JPL may include further development of NNFT in hardware with the goal of producing a standard Peripheral Component Interconnect (PCI) card with NNFT functionality. The PCI card implementation of the NNFT could have a range of applications, including realtime target tracking in the field.

For additional information, contact: Filiberto Macias at (505) 678-3169; email maciasf@wsmr.army.mil

Joint Pacific Range Support Team (PRST)

WSMR Extends Capability to the Pacific

(continued from page 6)

have been working hard to come together into one group to meet the test objective," Sanchez said, noting it was much like the "Army of One" concept.

Another area of WSMR involvement in the MDA PRST is the development of a Transportable Telemetry System (TTS). The TTS will provide a long-range missile telemetry (TM) acquisition, processing, and archiving with long-range communication capability in a transportable configuration. It is designed to support MDA mission requirements at various DOD ranges and nonrange locations in the Pacific (including Alaska, Hawaii, Midway, Wake Island, and the continental United States, as well as broad ocean areas between the ranges), augmenting capabilities at the existing ranges and providing mission support capabilities from remote areas that have minimum or no range instrumentation infrastructure. The TTS is capable of stand-alone TM collection and archiving, or collecting and providing TM to designated users.

The TTS configuration consists of two TM equipment vans, two containerized power generators, two large aperture antenna subsystems, and a Satellite Communication subsystem. The TTS will have the capability to receive multiple redundant TM streams. The preferred deployment will be at land-based locations (both on-range and off-range), whenever possible, and off-range shipboard locations when necessary. The primary intended use of the TTS will be to provide extended TM coverage and voice/data communications beyond current existing range capabilities. The TTS provides an over-the-horizon communications capability for realtime and post-mission voice and data communications, with the ranges and data processing centers. The initial use of the TTS is to provide mid-course TM coverage for GMD Integrated Flight Tests and to support other BMDS tests. Alternately, the TTS may be used to augment existing range assets to support test infrastructure, stressing BMDS tests at a specific range. If required, the TTS can be used to provide selected TM data to augment existing range assets in conjunction with an existing Range Safety System.

Other PRST efforts involving WSMR include the standardization of range safety policy, methodology, and procedures among the PRST ranges. Standardization will provide a single certification requirement for test hardware, allowing MDA programs to use any of the PRST ranges. We are also participating in instrumentation commonality/validation teams that will approve the use of range instrumentation at multiple ranges.

In summary, even though MDA testing has shifted to the Pacific, WSMR is utilizing the expertise gained through supporting BMDO tests in the 1990's and the mobile range instrumentation in our inventory to continue supporting MDA tests as part of the PRST. One of the benefits of PRST membership is the working relationships being developed with the other DOD and commercial ranges. While the level of WSMR participation on specific MDA flight tests will vary, this association with MDA is viewed as a long-term commitment.

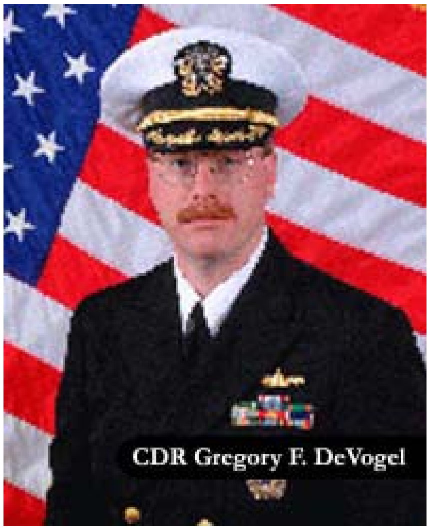
For additional information, contact Greg Vickers at (505)-678-1241; email: gvickers@wsmr.army.mil ⌘

Figure removed for security reasons

Figure 2. Pacific Missile Range Facility in Hawaii

Joint Testing Planned for White Sands Missile Range

CDR Gregory F. DeVogel
Officer in Charge
Naval Surface Warfare Center Port Hueneme Division White Sands Detachment



There has been a Naval presence at White Sands Missile Range since 1946. The Navy has played a significant role in the tri-Service flavor of the Range. Although the three Services test at White Sands and work together, jointness has consisted mainly of sharing resources, expertise, and training exercises. Now, a new program called Naval Integrated Fire Control - Counter Air (NIFC-CA) will add an additional aspect to the cooperation at White Sands Missile Range.

A new program to test is always an exciting prospect for the Navy's White Sands Detachment. A whole new level of excitement has been raised with the advent of a new customer who will fundamentally change the detachment and possibly the whole missile range. The new customer, the Naval Integrated Fire Control- Counter Air (NIFC-CA), will provide opportunities and a new dimension in the way the Navy's test and evaluation is accomplished at this land- based facility.

Tests of air defense missiles are routine for the range; however, this is much more than a missile -- it is the Navy's future air defense architecture. The architecture includes netted sensors, fire control systems, communication, and joint participation. The entire architecture will be installed and tested at White Sands Missile Range.

Figure 1. USS Desert Ship

The architecture to be installed in FY06 and FY07 will include:

- The latest Navy fire control system, Aegis Baseline 7, installed in the USS Desert Ship (figure 1).
- A new air defense missile called Standard Missile 6, which uses active terminal guidance
- The Navy's Cooperative Engagement Capability (CEC), a communication system capable of sharing high-quality track data across platforms

Once in place, this architecture will be tested as a unit to ensure it achieves the necessary performance. However, the joint aspect of the system must also be tested. Army Patriot, Marine Corps, and Air Force units will provide tracks to the Navy system, and possibly the reverse as well, establishing a joint netted sensor and fire control network.

Additional information may be obtained from CDR Greg DeVogel at (505) 678-3896; email devogelgf@navair.navy.mil

ITEA Modeling and Simulation Workshop In Las Cruces

The White Sands chapter of the International Test and Evaluation Association hosted a 3-day workshop (December 13-16, 2004) at the Hilton Inn in Las Cruces, New Mexico. The program featured six tutorial sessions providing the most up-to-date methods for using modeling and simulation (M&S) to meet DOD testing needs. Areas addressed included T&E Using Distributed Testing, Validation of M&S, Use of M&S for Homeland Security, Range System Interoperability Using Test and Training Enabling Architecture, How to Conduct a Successful Simulation Study, and Simulation/Test of 21st Century Dismounted Combat Operations.

Tomas Chavez, Chief Technologist, Business and Technology Development Directorate, chaired the program which featured speakers from across DOD's T&E community. Featured speakers were David Dumas, DOD Principal Deputy Director for OT&E; Dr. John Foulkes, Director of Army Test and Evaluation Management Agency; and Honorable Silvestre Reyes, Texas Congressman. Dr. C. David Brown, DTC's Director for Test and Technology, chaired two of the sessions dealing with Collaborative Simulation and Testing and High-Performance Computing in Testing and Experimentation. (See page 11.)

The Developmental Test Command Test Technology Symposium 2005, to be held June 15-16 in Portsmouth, Virginia, will be a fitting followup to the ITEA event. The June symposium will highlight the applications of these technologies to the Joint Forces Command programs and to the distributed testing among all the Services.

ITEA Workshop Features Collaborative Simulation and Testing

Dr. Michael Barton
TRI-S Incorporated
Aberdeen, Maryland

Dr. C. David Brown, US Army Developmental Test Command Director for Test and Technology was assisted by Dr. Michael Barton (TRI-S Incorporated) in leading two sessions at a December workshop in Las Cruces, New Mexico. The following are some thoughts by Dr. Barton on the evaluation of simulation from a component design tool to a vital part of test and evaluation. Dr. Barton has played a key role in bringing applications of high-performance computing into the test and evaluation community.

Computational methods of testing, as we know them today, arose from a need to analyze component designs prior to their being built. Some prominent and proven examples of this analytical approach are finite element methods for bridges and aircraft structures, and finite difference methods for atomic bombs and airfoil/wing aerodynamics.

From component design analysis to finding solutions where test facilities do not exist

The methods progressed from component design analysis to solving problems which arose in existing systems, and were finally incorporated into the design process itself to reduce the number of candidate configurations tested, to reduce the size of the test matrix, and to provide solutions at points for which test facilities did not exist. The initial upshot was reduced cost, development cycle time, and risk, the results of examining a larger design space computationally than could be addressed experimentally.

By the late-1970s, Moore's law (the doubling every 18 months of the number of transistors in an integrated circuit), along with the development of custom chips, yielded the Cray-1 computer, the first in a spate of high-performance platforms that transformed scientific computations. This early "super computer" is shown in figure 1. Using the Cray, it became feasible to model more than individual components, and to incorporate more realistic physics.

Figure 1. Cray Super Computer

This ability to accommodate greater complexity extended modeling to testing itself, guiding the selection and placement of instrumentation, contributing to test facility design, and providing sanity checks during tests over a range of performance parameters for which computations were made. By the 1990s, complete vehicles were being analyzed and three dimensional (3-D) methods were used in design, analysis, and testing. The amount of data generated and the complexity of configurations modeled necessitated graphical pre- and post-processing tools, spawning an industry of grid generation, geometry definition, and visualization software. For a number of years, this progress occurred mainly in basic and applied research.

Figure 2: AIM-9X Missile Launch (Aided by HPC Modeling)

The testers are now quite active in the collaboration process. Incorporation of modeling into developmental and operational testing of weapon systems is evolving. The primary challenges are the greater complexity of complete weapon systems compared to an isolated vehicle, the severe time constraints for obtaining solutions, and the need to factor in the human element of the interaction. Compounding these challenges is the still too frequent practice of planning for developmental and operational testing late in the life of a new system and then sacrificing these steps as budgets and schedules become constrained. Delay of a test therefore often means delay of an entire program and fielding of a weapon system, and computational methods have not been sufficiently certified or responsive to assist with these challenges. This session at the ITEA Modeling and Simulation Workshop (Las Cruces, New Mexico, December 13-16) highlighted many of today's most promising efforts.

Joint scientific team provides new ideas

Doctors Brown and Barton also co-chaired a second session at the workshop entitiled "High-Perfornmance Computing in Testing and Experimentation." The session on Tuesday 14 December was supported by nine papers. Attendees received some new ideas on specific applications of High-Performance Computing (HPC) to testing. Topics included HPC Support of Joint Forces Command Experimentation, HPC Use in Modeling of the Airborne Intercept Missile (AIM-9X) as seen in figure 2, and Virtual Prototyping of Directed Energy Weapons.

For additional information, please contact Dr, Barton at 410-273-1473; email: joseph.michael.barton@dtc.army.mil

Army Chief of Staff's New Policy Requires a Two-pronged Testing Approach

Much of the planning and technology development within the Army test community during the last couple of years has focused upon the now well-known Future Combat Systems (FCS). The numerous new components of this system of systems were to be developed concurrently, or nearly so, and integrated into a new network-centric battlefield. Across the test community could be heard the battle cry: we must build a distributed network that will link a network of synthetic (simulations), and live tests of many components undergoing simultaneous tests at geographically separated test centers. Recently, the Army Chief of Staff provided guidance that requires some changes of direction and priorities for testers. Simply stated, the FCS will not be tested and fielded in one lump as a battle ready entity. Rather, the spiral development of individual components is envisioned. New components of FCS will emerge at different times based on differing development schedules and available funding. So, what does this mean to the test community? It means that we must not restrict our technology program to development of a super distributed testing network while awaiting emergence of all of the FCS components. Rather, we must work closely with developers to be ready to perform some traditional one-on-one tests to support evaluation of individual components. Simultaneously, the testers must continue to evolve the distributed testbeds which will ultimately be needed to verify the effectiveness of the emerging FCS. This two-pronged technology development will be difficult, but as indicated in the WSMR Commander's Overview article, they are aware of the needed change and are already addressing it in the WSMR programs. ⌘

FOR THE COMMANDER:

Richard S. Cozby
Chief, Technology Management Division
Directorate for Test and Technology

DISTRIBUTION:

Test Community (DOD, Academia, and Industry)
(Approved for public release, distribution unlimited.)

DEPARTMENT OF THE ARMY
TECHNOLOGY MANAGEMENT DIVISION (CSTE-DTC-TT-M)
US ARMY DEVELOPMENTAL TEST COMMAND
314 LONGS CORNER ROAD
ABERDEEN PROVING GROUND, MD 21005-5055

OFFICIAL BUSINESS

FIRST-CLASS MAIL
POSTAGE AND FEES PAID
ABERDEEN PROVING GROUND
MARYLAND 21005-5001
PERMIT NO. 1